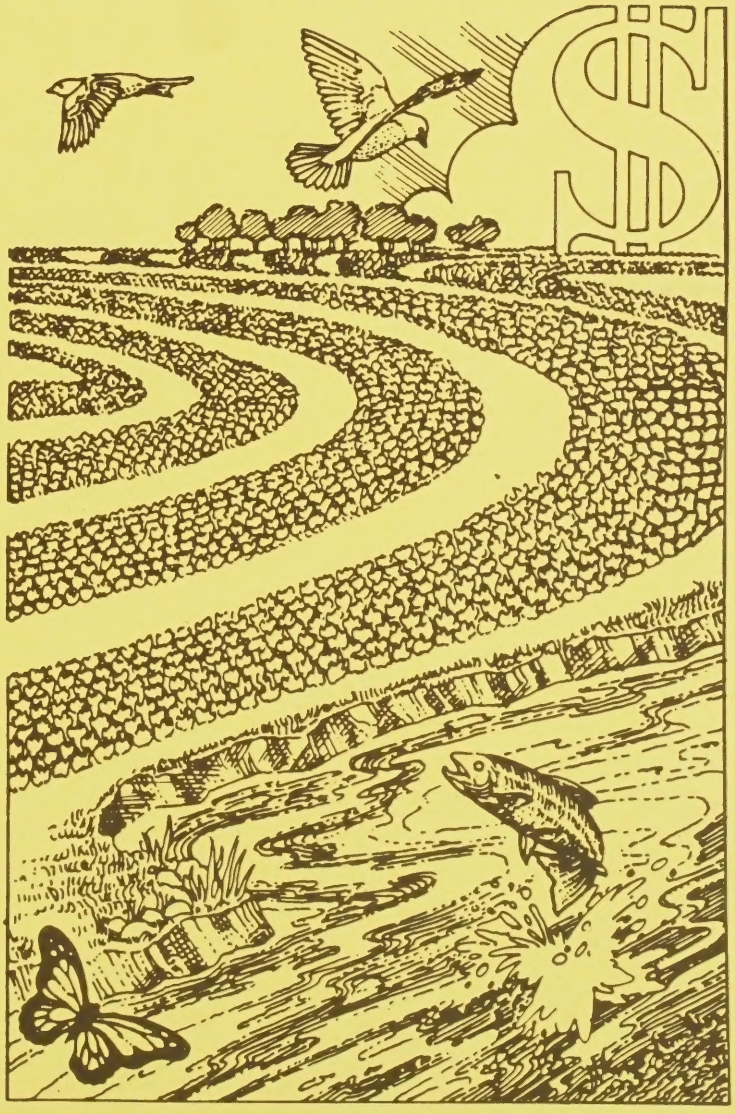
MICHIGAN

North-Central Region Projects Supported by Sustainable Agriculture Research and Education Program



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from project reports

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Overview of Michigan Projects

Congress has provided strong and growing support for the Sustainable Agriculture Research and Education grants program, also known as LISA (Low-Input Sustainable Agriculture). Administered by Cooperative State Research Service (CSRS), with the Cooperative Extension Service as a full partner, this program is forging partnerships between farmers, scientists, educators, agribusiness, non-profit organizations, and government -- a partnership that is beginning to promote better stewardship of the Nation's natural resource base. The program has supported 112 new projects since its inception in 1988; perhaps two dozen more will be funded by June.

Projects funded are typically carried out by teams of farmers, university research and education staff, government agencies, non-profit organizations, and private enterprise. Top priority is given to whole-farm integrated systems projects, usually including on-farm research and demonstrations. These projects are providing scientific documentation of low-input sustainable farming practices and systems, in comparison with conventional or chemical-intensive agriculture.

Farmer involvement is one of the strengths of this program. There has been active involvement in the administration of the North Central Region LISA program since its inception. Five producers from the region have served on the Administrative Council which develops policy and distributes funds. Six producers have also served on the Technical Committee which evaluates and recommends project proposals for funding.

Nationwide, 1,860 farmers have participated in projects during the first three years. When farmers participate in the planning and execution of a project, two important things happen. Concerns of farmers are foremost in the design of the project. And scientists get directly exposed to innovative ideas developed or tried by farmers. These ideas often become an integral part of scientific studies. The result is both better science and a more widespread adoption of more sustainable farming methods that are economically viable, socially acceptable, and environmentally sound, assuring cleaner water and a plentiful supply of safe food for generations to come.

Projects Funded 1988-1990

Two projects funded by this program that include Michigan scientists, farmers, or educators in major roles are described here. These projects received a total of $84,650, and provided $65,459 matching funds. In most of the projects, a scientist serves as the Project Coordinator. In others, a farmer or other local area residents are contributing to a multi-state project headquartered in another state.

Development and Demonstration of Methods toward Sustainable Apple Production: A Continuation of Systems Integration (LNC89-22)

Summary

This project on sustainable apple production is in response to a long-standing concern by ecologists, and more recently by the public, that the amount of chemicals used in the production of the apple crop is unwarranted and possibly harmful to humans and the environment. A quantitative biological monitoring and delivery system will be developed which will provide orchardists the ability to collect and quantify standardized observations on pests and apple production. This will make it possible to compare treatments across a network of apple growers interested in reducing chemical inputs to the apple ecosystem. This project will examine and evaluate alternative plant and animal systems in the apple orchard ecosystem, to increase biological diversity for pest reduction and to enhance predator effectiveness in orchards.

The research is being undertaken at two sites: a one-hectare experimental orchard at Michigan State University's Kellogg Biological Station (KBS) at Hickory Corners, MI and a 1.5 hectare 20 year old experimental apple block on the Double J Fruit Ranch, a commercial mixed fruit farm near Benton Harbor, MI. The KBS orchard was planted in 1983 using selected scab-resistant cultivars: Red Free, Priscilla and Liberty. To date, no pesticide or other chemical applications have been made, and the apples have not shown any evidence of disease damage. However, they do have significant codling moth, apple maggot, and plum curculio damage. The organic apple block at the Double J Fruit Ranch is being used as a pilot model as a prelude to a transition of the remainder of the Ranch to low-input production strategies.

During the first year of the project (1990), several initiatives were begun:

(1) A block in the KBS orchard and the experimental block at the Double J Fruit Ranch were subjected to codling moth pheromone disruption. Codling moth is a significant apple pest which is responsible for the "wormy apple" syndrome. The disruption techniques used Consep TM membrane disruption dispensers, which are strips of foil impregnated with codling moth female sex pheromone. These strips of foil may be easily wrapped around the branches of trees. The dispensers emit minute amounts of pheromone, imitating the emissions of female moths. When dispensers are concentrated sufficiently within an area, they saturate the air with pheromone chemical. The male moths become confused, since they cannot locate females through this thick chemical "fog". They continue flying around in this intensely perfumed area, trying to locate

females until they die from exhaustion. In theory, then, mating is "disrupted" or prevented since males are unable to find a mate. At KBS and at Double J Fruit Ranch, male detection of pheromone signaling was monitored for both first and second generations of moths. During both generation cycles at KBS, lower numbers of male moths were caught in the disrupted block than in the undisrupted areas, except for one week during the second generation when there was an isolated peak in male moth catch in the disrupted block. This peak may have been due to a population explosion occurring in the second generation. Codling moth apple damage was lower in the disrupted block than in the undisrupted areas. At the Double J Fruit Ranch, male moth catches in the disrupted experimental block were lower than in a check block on the farm. Damage was also 40-60% lower than the previous year.

In conclusion, disruption pheromone can reduce matings among codling moth populations considerably. However, since codling moth populations in the East and Midwestern states (including Michigan) tend to be high, other measures in addition to disruption are necessary to reduce the level of codling moth damage. In 1991, the project will include the use of B.T. *(Bacillus thuringiensis)*, a biological control, on codling moth larvae. Precise timing of B.T. applications will be facilitated by onsite weather instrumentation.

(2) Populations of predatory insects (lacewings and ladybird beetles) were monitored from May to September at both sites. The KBS orchard had higher densities and greater variety of ladybird beetles and lacewings than Double J Fruit Ranch. Presumably, this is due to the presence of alfalfa, corn, oat, and other grain fields around the KBS orchard, which provide alternate habitat and food for predators. In contrast, Double J is surrounded by orchards, to which fewer species of ladybird beetles are biologically adapted. Both orchards demonstrated higher densities of lacewings than ladybird beetles overall. This may indicate that lacewings are more adaptable to trees and orchard environments than ladybird beetles. Lacewings also were present more continuously throughout the season at both sites than ladybird beetles.

(3) Chickens were introduced in the KBS orchard to evaluate their efficacy in reducing damage by the plum curculio and other pests. The chickens were fenced in directly under the trees in four of the orchard rows and foraged continuously from July to September. Harvest data indicated that damage by plum curculio was 25-40% lower in the chicken rows than the rows where there were no chickens. Codling moth damage was also lower in the chicken rows; however, this may have been an effect of orchard location which will be examined in 1991.

An unanticipated but highly significant effect of the chickens was their weed control-- they strip underlying tree vegetation to bare ground. This effect was due to foraging, trafficking, and the toxicity of chicken waste on the weeds. In many orchards, "herbicide strips" are created along the tree rows to eliminate weed competition for water and nutrients. The chickens showed a similar effect to herbicides to reduce weed populations. The chickens' potential as an alternative to herbicides will be investigated more closely in 1991.

Project Coordinators:	Stuart H. Gage, **Michigan State University**; and Kenneth McNamara **Rodale Institute**
Major Participants:	**Michigan State University**
Farmer:	**Michigan:** J. Van Newenhizen
Project Duration:	2 Years
Total Funding:	LISA Funds: $24,500; Matching Funds: $14,750

Utilization of the Allelopathic Properties of Winter Rye as a Method of Weed Control in Soybean Production (LNC88-21)

Summary

A two-year field study was initiated in 1989 by scientists with the Rodale Institute and the University of Wisconsin. Three experiments were done at the University of Wisconsin's Arlington Research Farm, and at seven on-farm sites throughout the Midwest. The purpose of this project was to determine the effectiveness of a cover crop (winter rye) to control weeds in soybean production. Various methods of managing the rye cover crop were examined. A major challenge is to terminate the rye cover crop in a way that will retain its allelopathic weed control power, while avoiding a regrowth or "retillering" of the rye that could tower over the soybeans, greatly reducing their yield.

In the *first experiment*, fall-planted winter rye was killed via three methods (glyphosate, mowing and tillage) and at three different growth stages (tillering, boot, and pollination). Rye that was killed with herbicide (glyphosate) plus mowing adequately controlled weed populations equal to the herbicide treatment checks. Rye killed by chisel plowing did not adequately control weeds at any stage. The exception was that rye killed at the tillering stage with glyphosate exhibited a significant decrease in weed control compared to herbicide checks, perhaps due to the lower quantity of rye biomass.

The *second experiment* conducted at Arlington evaluated rye and oat in combination with a hairy vetch companion crop for weed control in no-till soybean. The oat winter-killed (as expected) and the rye was killed with glyphosate. There was no difference in percent weed control between the narrow row soybean planted into rye and the narrow row or wide row soybean with no cover that received an application of a pre-emergence herbicide. The weed control for all these treatments ranged from 88 to 95% control.

The *third experiment* evaluated four herbicides and cultivation for their ability to control rye which re-tillered after mowing in the boot stage. The objective was to enhance the allelochemical control of annual weeds by allowing additional rye biomass accumulation after planting soybeans in 30" rows. All grass herbicides, applied 14 or 21 days after mowing, adequately (83%) controlled the re-tillering rye regardless of rate. Cultivating two times controlled the rye at levels comparable to the grass herbicide treatments. A single cultivation and glyphosate, applied prior to mowing, had slightly higher weed control (98%), than all other treatments except the glyphosate-only treatment. Weed control was enhanced when herbicides were applied later in the season.

Description of Participating Michigan Farmer

Bob and Joanne Fogg (Leslie, MI). This is a dairy farm in south-central Michigan which includes 20 Holstein milking cows and 20 heifers. They grow 500 acres of corn, soybean, alfalfa, oat, rye, hairy vetch and buckwheat. Grass was the dominant weed in the rye strips. The cultipacking of the rye killed it effectively; no retillering occurred.

Project Coordinator:	James Tjepkema, **Rodale Institute**
Major Participants:	University of Wisconsin: J. Doll, T. Bauer
Farmers:	**Iowa:** R. Thompson; **Michigan:** R. Fogg; **Missouri:** R. Harmon; **Illinois:** T. Holsapple; **Ohio:** R. Bennett; **Wisconsin:** J. Bauer; **Nebraska:** G. Zicafoose
Project Duration:	2 Years
Total Funding:	LISA Funds: $60,150; Matching Funds: $50,709